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ABSTRACT

This booklet on population is one of a series in environmental education for grades K-12. The activities contained within develop the concept of origins of life and the role of culture in determining population interactions. Four basic concepts are listed and the behavioral objectives, associated subject areas, and key words and definitions are included for each. Three activity options are given for each concept. Information for the teacher includes materials and resources needed for the activity, the procedure, discussion questions, further activities, and sample worksheets. These activities are interdisciplinary in nature and designed for students in grades 6-8. (MA)

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POPULATION

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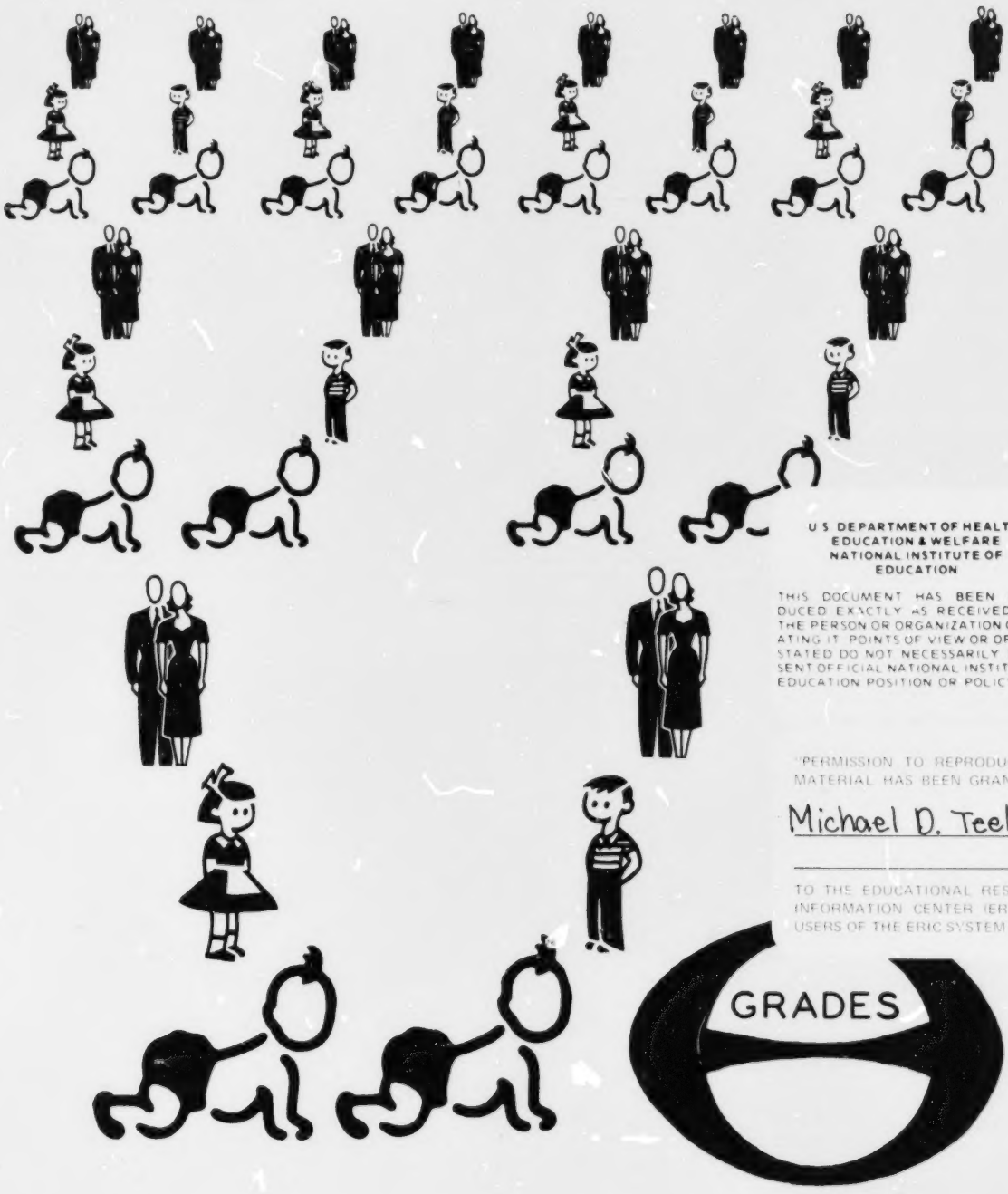

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GRADES 6

ENVIRONMENTAL EDUCATION

VALUES FOR THE FUTURE

ANTIOCH COMMUNITY SCHOOL DISTRICT 34

TITLE IVC ESEA

SE 023 451

TABLE OF CONTENTS

Page

Explanation of concept area 1

Synopsis

Population 10: At the completion of this unit the student will be able to identify the different theories about the origin of living things.

Option 1 - Students investigate the different theories about the origin of life. .. 3
Option 2 - Students study about fossils and make their own. .. 4
Option 3 - Students stage a mock Johnny Carson Show on the origin of life. .. 7

Population 11: At the completion of this unit the student will be able to list at least one way in which the United States population consumes a disproportionate amount of the earth's resources.

Option 1 - Students make bar graphs from world consumption information given in chart form. .. 9
Option 2 - Students chart their daily activities on a clock and investigate the energy usage during this time. .. 15
Option 3 - Students write letters to foreign countries to determine energy usage. .. 17

Population 12: At the completion of this unit the student will be able to explain why different standards of living produce different environmental consequences.

Option 1 - Students do a survey of goods purchased in a local supermarket. .. 19
Option 2 - Students make a comparison between past and present lifestyles and their effect on population. .. 22
Option 3 - Students do a utility consumption survey. .. 28

Population 13: At the completion of this unit the student will be able to explain how interactions between populations may be complimentary, competitive, or mutually beneficial.

Option 1 - Students investigate a vacant lot for a study of litter and population of plants and animals. .. 33
Option 2 - Students collect trash and map problem trash areas. .. 40
Option 3 - Students construct a terrarium for observation. .. 43

EXPLANATION OF CONCEPT AREA

POPULATION - To study populations we must understand the variety of factors interacting on a global basis to make the area an important part of environmental education.

We begin by making students aware of the variety of populations and the steps they take to satisfy their needs.

In grades 3-5 we develop the idea of systematic interactions to provide checks and balances for population growth. We also explore the role of man and his lifestyle.

These are followed by the development of the concept of origins for life and the role of culture in determining population interactions.

In high school the student focuses on populations and their impacts as modified by culture and resource needs.

POPULATION 10

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to identify the different theories about the origin of living things.

SUBJECT AREAS:

Language Arts, Science, English, Crafts

KEY WORDS AND DEFINITIONS:

Artifacts - Any object made by man with a view to future use.

Evolution - A process of formation or growth by which organisms adapt to their environment.

Fossil - Any remains, impression, or trace of an animal or plant of a former geological age.

2

OPTION #1

MATERIALS AND RESOURCES

Bible
Mankind Child of the Stars
Inherit the Wind
Origin of the Species
Chariot of the Gods
Life Long Ago, Singer Earth Science Series
Playboy Article, August, 1974 (VonDanikan)
Pictures of Fossils
Shoeboxes

PROCEDURE:

1. Explain to students that there are many conflicting theories about the origin of life, ranging from biblical to radical. Of these theories, three stand out as the most prominent: 1) Bible Origin; 2) Evolution Origin; and 3) Outer Space Origin.

2. Divide the class into three interest groups, each of which will emphasize one of the three above theories in their research.

3. Give the groups a certain amount of time to prepare a defense for their particular theory. (Or they may choose to refute the other two theories, leaving their theory the only real alternative.) Some suggested readings are given above.

4. Have each group prepare a shoebox with artifacts which defend their position. The boxes may have pictures, fossils, or whatever they feel supports their position.

5. A spokesman from each group will give a five minute presentation on their position. Other "experts" may be called in to testify. These presentations would be best presented in front of another neutral class or group acting as jurors to decide which presentation is most believable.

6. After each group has given their presentation, allow the "jurors" a short question session.

7. Have the jurors vote on which is the most believable position.

FURTHER ACTIVITIES:

1. As a writing exercise, the students can be asked to write a short essay on why they feel the "jury" voted the way they did.

2. Have the students participate in a values continuum exercise on the origin of life.

OPTION # 2

MATERIALS AND RESOURCES

½ pint milk cartons
Vaseline
Modeling Clay
Shells, leaves, objects of nature
Fossils
Plaster of Paris
Water Paints
Filmstrip, Up Through the Coal Age, Coop
Filmstrip, How We Know About Life Long Ago
Filmstrip, Stories That Fossils Tell

PROCEDURE:

1. Show the filmstrip, Up Through the Coal Age. Discuss.

2. Show the filmstrips, How We Know About Life Long Ago and Stories That Fossils Tell. Discuss.

3. Procedure for Making Fossils:

   A. Use objects which have been living at one time. The objects must have a hard surface with the exception of leaves. Have students bring in at least two objects - one common area object and one "mystery" object.

   B. Clean out milk cartons and cut off the tops, leaving just the square bottoms.

   C. Smear fossil object with vaseline on the side to touch the plaster. This is to prevent sticking.

   D. Mix plaster with water and place in milk carton. While the plaster is still soft, press object gently into the surface. Leave one edge of the object exposed so it can be peeled off when the plaster hardens.

4. Have students compare their real object with their fossil. Next have them make a fossil with their mystery object. (Number each one)

5. Give a code number to each carton. List student's name and mystery object.

6. Collect and randomly distribute cartons. Each student must try to recreate with clay and paints or draw what he thinks the mystery object is. Students should try to include as much detail as possible. Allow at least one full class period. When all the students are done, have volunteers present his model or drawing and explain why he thought the mystery object looks that way. Then present the real object and compare. Discuss.

7. Discuss other theories of the origin of life.

OPTION #2 Con't

DISCUSSION QUESTIONS

1. The theory of the origin of life used in the filmstrips is that all forms of life have evolved according to conditions through history. Do you agree or disagree? What proof do they have?

2. In making your own fossil, did it show enough detail of your object that you think you could reconstruct it as scientists have reconstructed plants and animals of the past? How accurate do you think you could be without ever seeing the original object?

3. In recreating your mystery object, what methods did you use? Did you consider your present knowledge of living things to help you?

4. Do you feel that fossils prove the theory of evolution? What other theories exist? What evidence is there to support those theories?

FURTHER ACTIVITIES

Have students play "Evolution " the geologic time chart game, available from the E^2 Office. This will give students a better understanding of the possible evolution of man and other species.

STUDENT INSTRUCTIONS

PROCEDURE FOR MAKING FOSSILS

A. USE OBJECTS WHICH HAVE BEEN LIVING AT ONE TIME. THE OBJECTS MUST HAVE A HARD SURFACE WITH THE EXCEPTION OF LEAVES. HAVE STUDENTS BRING IN AT LEAST TWO OBJECTS - ONE COMMON AREA OBJECT AND ONE "MYSTERY" OBJECT.

B. CLEAN OUT MILK CARTONS AND CUT OFF THE TOPS, LEAVING JUST THE SQUARE BOTTOMS.

C. SMEAR FOSSIL OBJECT WITH VASELINE ON THE SIDE TO TOUCH THE PLASTER. THIS IS TO PREVENT STICKING.

D. MIX PLASTER WITH WATER AND PLACE IN MILK CARTON. WHILE THE PLASTER IS STILL SOFT, PRESS OBJECT GENTLY INTO THE SURFACE. LEAVE ONE EDGE OF THE OBJECT EXPOSED SO IT CAN BE PEELED OFF WHEN THE PLASTER HARDENS.

OPTION #3

MATERIALS AND RESOURCES

Bible
Inherit the Wind
Mankind Child of the Stars
Newsweek, July 15, 1974, "Promises and Problems"

PROCEDURE:

1. Explain to the class very generally the theories on the origin of man.

2. Explain that the class must investigate both theories as best as they can.

3. Tell the students that they are going to put on a TV show very similar to the Johnny Carson Show. Each will play a role in the show and must help in writing the script. If possible, videotape the show or tape record.

4. Set about assigning roles to the class. Explain that each role requires research to make them go. Pick a Johnny Carson who will be a question asking or mediator-type personality, Ed McMahon, Doc Severinson and maybe 3 or 4 members of the band, Charles Darwin (obtain the book), Pastor Hayward Hyfill and any number of other characters that will support each theory. Perhaps a gorilla, Uncle to Charles who would support Drawin's theory. Dr. Leaky who would support Darwin's theory. Be sure to have some students for the audience.

5. Have all the members of the class do some research on these theories. Write questions and answers for each member of the cast.

6. From the questions, write up a format. Leave it open for debate.

7. Put on the show.

8. Have each individual write an essay on whose theory or combination of theories they believe in and why.

DISCUSSION QUESTIONS:

1. Do the theories sound logical?

2. Is anyone sure one theory is right and the others wrong?

3. What proof do you have to support your choice of theories?

4. Is it possible to combine the theories?

POPULATION 11

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to list at least one way in which the United States population consumes a disproportionate amount of the Earth's resources.

SUBJECT AREAS:

Math, Social Studies

MATH SKILL:

At the completion of this unit the student will be able to convert information given in chart form into bar graphs.

KEY WORDS AND DEFINITIONS:

GNP - Gross National Product: Amount of goods, services, or money obtained by persons of a certain area

Per capita - per person

OPTION #1

MATERIALS AND RESOURCES:

Graph paper
Straight edge

PROCEDURE:

The charts onthe following pages give a series of statistics for different environmental topics. The student is to construct a bar graph for each of the five headings, following the example below:

Example:

Construct a population bar graph from the information provided in the chart.

Step 1 - Select a scale to be used. In this case since the population figures run from 8 to 536 million, increments of 10 million can be used. Place these increments along the horizontal axis. Note the break in the axis between 220-550 million. Otherwise tne graph would need to be extremely long.

Step 2 - Place the names of the countries along the vertical axis.

Step 3 - Draw bars of the appropriate length to show the population of each country.

Next have the students draw bar graphs to show the following data:

1. the area of each country
2. protein supply of each country
3. nuclear power generation of each country
4. GNP of each country
5. density/mile sq.
6. phones/1000 people
7. TV sets/1000 people
8. GNP/capita
9. steel consumption/capita

DISCUSSION QUESTIONS:

1. Give some reasons why the United States might lead in consumption of protein and nuclear power.

OPTION #1 Cont.

DISCUSSION QUESTIONS: Cont.

2. What other areas, not represented by the chart, might the United States be very near the top?

3. Why might Sweden and Switzerland have such a high gross national product?

4. Does this disproportionate share appear within our own country, state, city, locale?

FURTHER ACTIVITIES:

Have students make graphs for other resources and materials, i.e. water, oil, etc. To compare how the United States stands in relation to other nations. Data can be found in almanacs, encyclopedias, etc. under the topic WORLD DATA.

STUDENT DIRECTIONS

THE CHARTS ON THE FOLLOWING PAGES GIVE A SERIES OF STATISTICS FOR DIFFERENT ENVIRONMENTAL TOPICS. YOU ARE TO CONSTRUCT A BAR GRAPH FOR EACH OF THE FIVE HEADINGS.

EXAMPLE: CONSTRUCT A POPULATION BAR GRAPH FROM THE INFORMATION PROVIDED IN THE CHART.

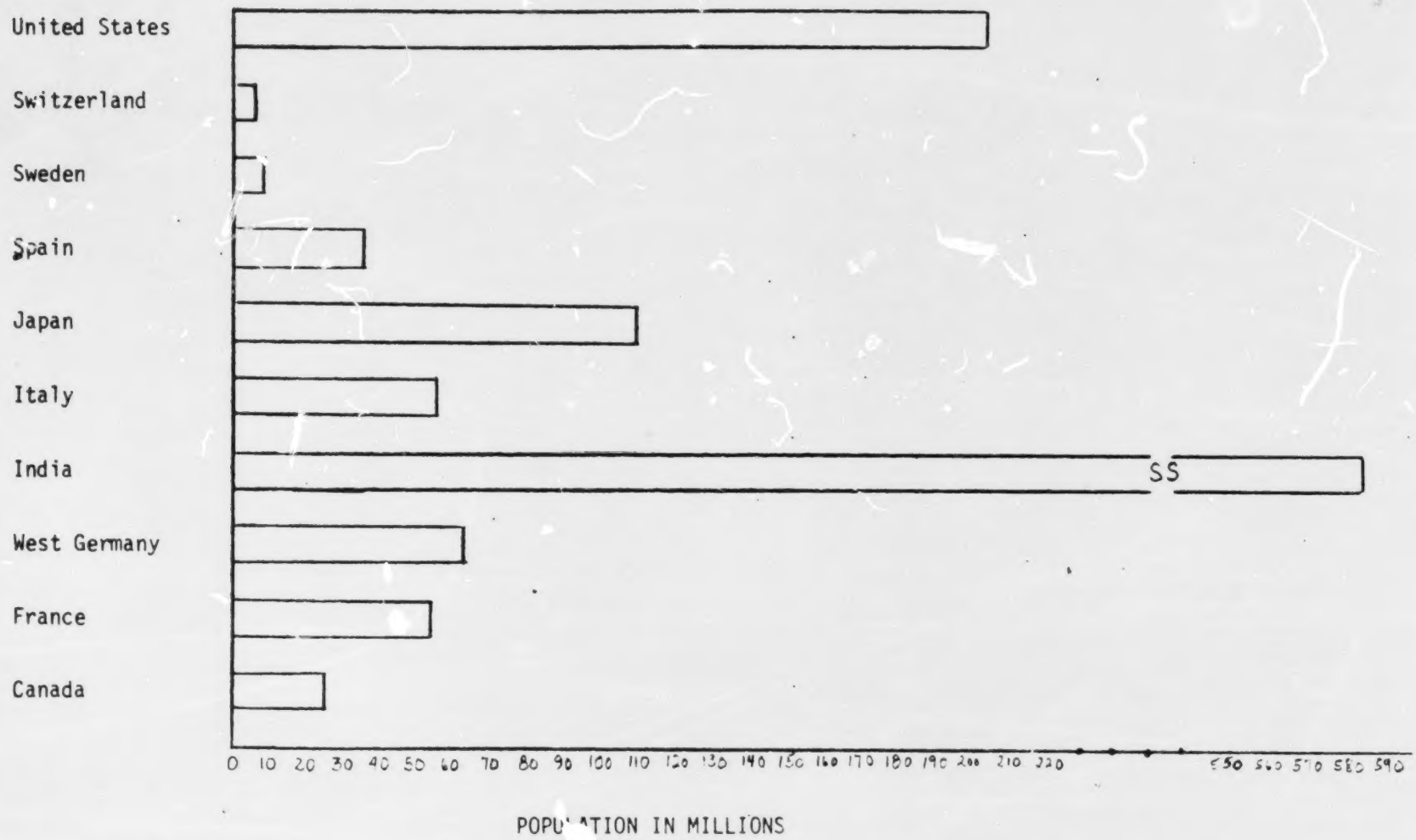
STEP 1 - SELECT A SCALE TO BE USED. IN THIS CASE SINCE THE POPULATION FIGURES RUN FROM 8 TO 586 MILLION, INCREMENTS OF 10 MILLION CAN BE USED. PLACE THESE INCREMENTS ALONG THE HORIZONTAL AXIS. NOTE THE BREAK IN THE AXIS BETWEEN 220-550 MILLION. OTHERWISE THE GRAPH WOULD NEED TO BE EXTREMELY LONG.

STEP 2 - PLACE THE NAMES OF THE COUNTRIES ALONG THE VERTICAL AXIS.

STEP 3 - DRAW BARS OF THE APPROPRIATE LENGTH TO SHOW THE POPULATION OF EACH COUNTRY.

NEXT HAVE THE STUDENTS DRAW BAR GRAPHS TO SHOW THE FOLLOWING DATA:

1. AREA OF EACH COUNTRY
2. PROTEIN SUPPLY OF EACH COUNTRY
3. NUCLEAR POWER GENERATION OF EACH COUNTRY
4. GNP OF EACH COUNTRY
5. DENSITY/MILE SQ.
6. PHONES/1000 PEOPLE
7. TV SETS/1000 PEOPLE
8. GNP/CAPITA
9. STEEL CONSUMPTION/CAPITA


United States
Switzerland
Sweden
Spain
Japan
Italy
India
West Germany
France
Canada
SS
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220
550 560 570 580 590
POPULATION IN MILLIONS

COUNTRY	POPULATION	AREA SQ. MILES	PROTEIN SUPPLY grams/day/person	GENERATION OF NUCLEAR POWER billion KWH	GROSS NATIONAL PRODUCT PER CAPITA
CANADA	22,659,000	3,851,809	63	.97	$ 5372
FRANCE	52,510,000	212,973	52	1.56	4851
WEST GERMANY	62,040,000	95,815	48	1.51	5618
INDIA	586,270,000	1,229,919	6	.32	117
ITALY	55,586,000	116,303	27	.34	2520
JAPAN	109,670,000	143,574	17	.99	3812
SPAIN	35,220,000	194,883	19	.54	1728
SWEDEN	8,176,691	173,665	53	.97	6155
SWITZERLAND	6,480,000	15,941	52	.69	6346
UNITED STATES	203,235,298	3,536,855	66	14.71	6155

Reader's Digest Almanac & Yearbook 1976

Time Magazine, December 23, 1976
The Five Worlds

17

COUNTRY	DENSITY	TELEVISION SETS (1)	TELEPHONES (1)	GROSS NATIONAL PRODUCT (2)	STEEL CONSUMPTION (3)
CANADA	5.9/mile^2	348	523	$6,361.00	N.A.
FRANCE	251.3	237	217	4,660.00	370
WEST GERMANY	645.9	298	287	5,671.00	590
INDIA	476.6	1	3	99.00	100
ITALY	477.9	208	229	2,706.00	330
JAPAN	763.8	229	354	4,050.00	500
SPAIN	180.7	164	31	1,751.00	195
SWEDEN	47.1	339	612	6,840.00	615
SWITZERLAND	406.5	253	554	7,200.00	N.A.
UNITED STATES	57.5	523	654	6,926.00	690

(1) Per 1000 population

(2) Per capita

(3) limits to growth, 1968, kilograms/capita

Reader's Digest Almanac & Yearbook 1976

OPTION #2 - two to three days

MATERIALS AND RESOURCES

Paper and pencils

PROCEDURE:

1. Have the students take home Form A and follow the directions carefully.
2. On the following day have the students write in the left hand margin of Form A the type of energy consumed during that thirty minutes, i.e. traveling home = gasoline, watching television = electricity, etc.
3. For every energy source listed, have the students subtract one from a perfect score of 17, i.e. if they used no energy for the entire time, they would score 17 for the 17 segments.
4. Have students relate scores and energy consumption lists.
5. An important concept will emerge in discussion. We consume energy every second of the day.

DISCUSSION QUESTIONS

1. What forms of energy are listed?
2. Are there forms of energy we have overlooked?
3. Is there any moment in the day that we do not consume some form of energy?
4. Is our level of consumption always necessary?
5. What area(s) could we cut back on our personal energy consumption?
6. What area(s) of energy consumption must remain the same?
7. Does the individual have any large impact on the energy consumed?

OPTION #2 ENERGY USAGE CHART FORM A

For every thirty minute segment of time, list two major activities you did during that time. For example, eating, watching television, traveling home, sleeping, etc. If you watched television for the entire thirty minutes, list it twice.

4:00	_____	_____
4:30	_____	_____
5:00	_____	_____
5:30	_____	_____
6:00	_____	_____
6:30	_____	_____
7:00	_____	_____
7:30	_____	_____
8:00	_____	_____
8:30	_____	_____
9:00	_____	_____
9:30	_____	_____
10:00	_____	_____
10:30	_____	_____
11:00	_____	_____
11:30	_____	_____

OPTION #3

MATERIALS AND RESOURCES

Man: An Ecological Approach, Educational Design, Inc.

Philippine Cultural Office - DE 2-6458
German Consulate General - AN 3-0850
British Consulate General - 346-1810
Chinese Consulate General 372-1213
Ministry of Education
11 Chungshan
South Road
Taipei Taiwan, Republic of China

PROCEDURE:

1. As an introduction to this unit, obtain the kit, Man: An Ecological Approach. Show and discuss the filmstrips in the kit or if time is a factor, choose those which you consider most relevant and show them.

2. Have the students develop a list of questions and write letters to schools in other countries asking that a teacher have students estimate costs and amounts of a select list of items and resources used by a family.

3. Have each student fill out the survey and send one with their letter.

4. It will probably take a considerable amount of time to receive replies. Thus, it may be wise to spread this unit out over a period of time so as not to lose student interest.

5. Average both surveys and chart them for display.

DISCUSSION QUESTIONS

1. Which items were out of proportion?

2. What are the reasons for this?

3. Who consumed more food? What types of food?

4. Why is this true?

5. Who uses more gasoline?

6. How can we change our lifestyle?

POPULATION 12

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to explain why different standards of living produce different environmental consequences.

SUBJECT AREAS:

Math, Consumer Education, Social Studies Language Arts, Science

OPTION #1

MATERIALS AND RESOURCES

Chart (See Attached)
Wall Chart, large wrapping paper
Marking pens

PROCEDURE:

1. Before you begin this unit talk to the food store manager and explain you wish to have your students survey what customers are buying. Explain also that these students will not interfere with the routine of the workers and customer response is voluntary.

2. Tell students that they will be surveying what is being purchased in a grocery store for a certain time period and they will tally the numbers of items in each category.

3. Give each student a copy of the check-off sheet. (See attached)

4. Have students check prices on delicatessen items and meat mentioned in discussion questions.

5. After the data has been collected, make a wall chart and total all the data.

6. Have students check out methods and costs of disposal of litter and garbage at the stores.

DISCUSSION QUESTIONS:

1. How many throw away items were purchased? (Bottles, cups, bags, tissues, plates, etc.)

2. Could any of these items be packaged differently so that the container could be returned or the item made reusable?

3. Did customers buy more fresh or canned vegetables? Also compare fresh to frozen and canned to frozen items.

4. Would it be impractical to have only fresh foods in a grocery store?

5. What happens to the packages such as cans, plastics, bags, etc. that leave the grocery store?

6. Could cans or throw away bottles be used for something else? A new product, perhaps?

7. Did many customers buy prepared types of food?

OPTION #1 Cont.

8. Is it cheaper to buy food prepared at the store? Note: Be sure the students consider the cost and time of cooking it at home compared to buying it prepared at the store.

9. How has food preparation changed in the last fifty years?

10. How does fresh food compare to canned, frozen or prepared food in nutritional quality?

11. Do you prefer prepared food or fresh food? Why?

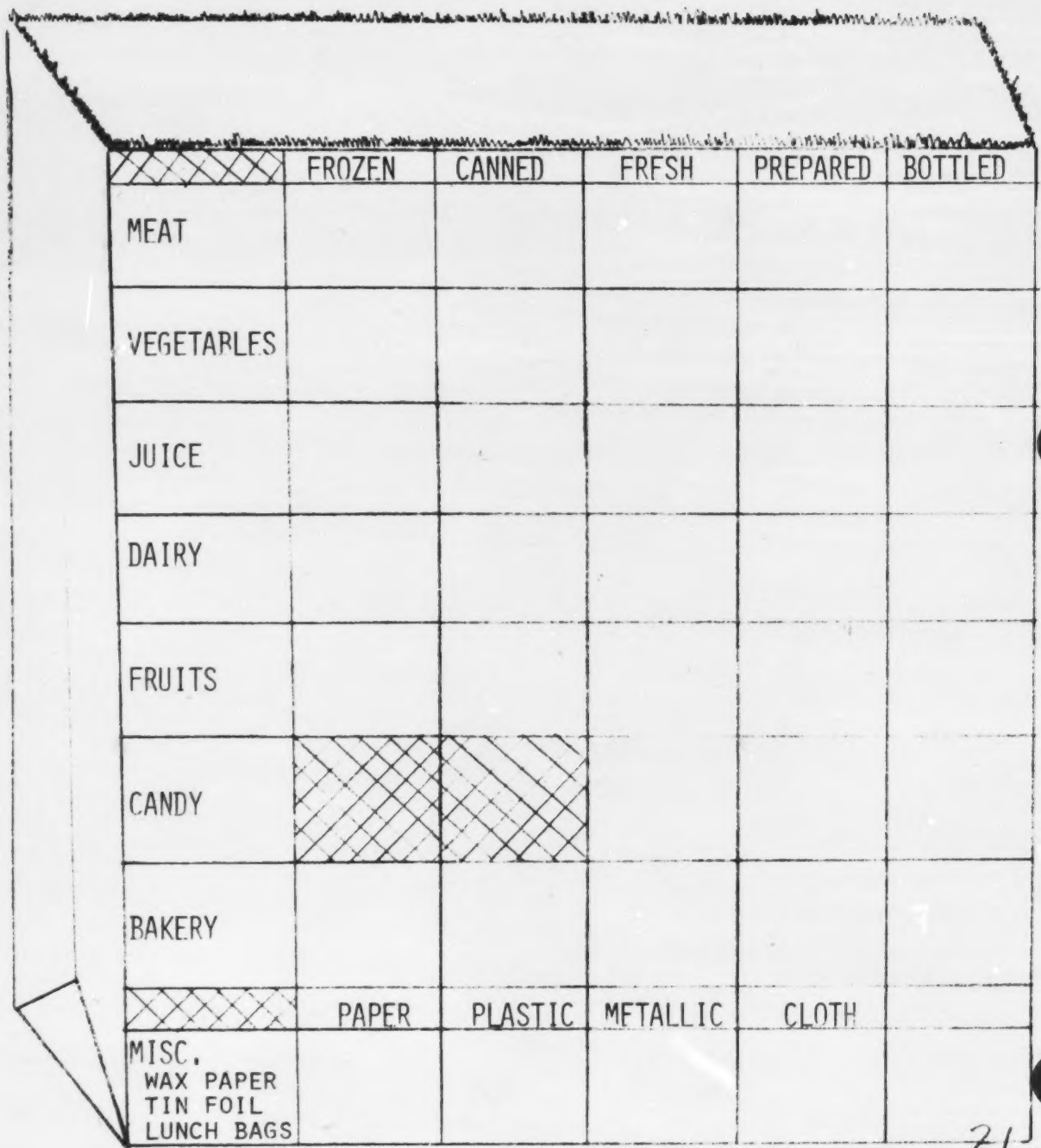
12. Would it be possible for everyone to grow their own food? Explain.

STORE NAME_____

NUMBER OF CUSTOMERS_____

DAY OF THE WEEK_____

ARE YOU BUYING MORE _____ LESS_____
PREPARED FOOD THAN A YEAR AGO?



	FROZEN	CANNED	FRESH	PREPARED	BOTTLED
MEAT					
VEGETABLES					
JUICE					
DAIRY					
FRUITS					
CANDY					
BAKERY					
	PAPER	PLASTIC	METALLIC	CLOTH	
MISC. WAX PAPER TIN FOIL LUNCH BAGS					

21

OPTION #2

MATERIALS AND RESOURCES

Film about early American or pioneer life or lifestyles of other cultures such as Had You Lived Then and Everyday Life in Colonies

Charts

Readings on early environments

Sand County Almanac
Man's Impact on Nature
A Vanishing Thunder
The Only Earth We Have
Letter to the President

PROCEDURE:

Part I

1. This unit will compare past and present lifestyles and the effect of these lifestyles on population. This will be done through a series of steps.

2. Show the students a film dealing with early lifestyles. Discuss the impact they think these lifestyles might have on the environment.

   a. Are they in harmony with nature?

   b. Do lifestyles cause a change in population size, or vice versa?

   c. Are these lifestyles suitable for large populations?

   d. What populations depend upon technology as a major part of their lifestyle?

3. Divide the class into two teams for each chart; one team takes 1800 and the other takes 1975. Each group is responsible for filling in the blanks in their chart. The teams may use any type of resources, films, interviews, books, etc. (See chart next page.)

4. If the students have any additional categories to suggest, use them as they pertain to the topic.

5. When all the groups have their data together, have them make a presentation to the class using the charts and any other resources they have obtained.

Part II

1. Distribute a timecard to the members of the class.

2. Ask all class members to write a short story about their adult lives on the basis of information provided on the timecards and to list those things they would like to have as adults in that situation (a carriage, a car, a farm, a professional business, etc.).

3. Have the students include in their story a description of the lifestyles they would lead in that future situation and to name the things they might own.

4. List those possessions on the blackboard.

OPTION #2 cont.

5. Use the charts from Part I to analyze each student's future plans in relation to environmental effects.

DISCUSSION QUESTIONS

1. Comparing items from the two lists, which set of possessions requires more resources to manufacture?

2. How has this affected the environment?

3. Which way is best in the long run?

4. Are conveniences really good in the long run?

5. Can you suggest some way to evaluate some of the new "wonder" inventions for long term suitability.

6. How is lifestyle modified by culture, climate, history, development, etc.?

7. Can we say that our lifestyle has changed in 200 years? Name some of the ways.

8. What was the colonial man's impact on his environment compared to present-day man?

9. How have prices changed for resources used now and for the same resources used 100 years ago?

10. What factors have brought this change about?

11. Judging from these patterns of change, what can you predict about resource use and resource prices in the next 100 years?

12. Is there a difference in the amount of waste materials connected with an improved standard of living?

13. Can you suggest some ways we in 1977 may be able to fight back against the bad environmental effects of our "good" standard of living? What can you and your family do?

FURTHER ACTIVITIES

As a concluding activity, have the students read the letter on the following page. The letter, in itself, should lead to some interesting discussion.

OPTION #2 TIMECARD

LOOK AHEAD INTO THE FUTURE 100 YEARS. WHAT KIND OF PLACES WOULD YOU LIKE TO LIVE IN AS AN ADULT? WRITE A SHORT STORY ABOUT YOUR LIFE IN THE FUTURE. INCLUDE DESCRIPTIONS OF LIFE STYLES, TYPES OF TRANSPORTATION, JOBS, ENTERTAINMENT, STYLE OF HOME, AND PERSONAL POSSESSIONS.

OPTION #2 CHART

1800 TRANSPORTATION 1975			
MEANS	POWER	KIND OF ROUTE OR ROAD USED	ENVIRONMENTAL EFFECT
1.			
2.			
3.			
4.			

1800 FARMING 1975			
ACREAGE AND CROPS	TOOLS	FARMING METHODS	ENVIRONMENTAL EFFECT
1.			
2.			
3.			
4.			

1800 MANUFACTURING 1975				
PRODUCTS	TOOLS	POWER SOURCES	PACKAGING AND ADVERTISING	ENVIRONMENTAL EFFECT
1.				
2.				
3.				
4.				

25

OPTION #2 CHART

26

1800 AVERAGE HOME AND FURNISHINGS 1975				
Size of home no of rooms	Types of light types of heat	Building materials	Appliances	Env. Effect

1800 PERSONAL POSSESSIONS 1975				
Kind of clothing	Books	Appliances	Recreational equipment	Env Effect

A Letter to the President:

The Great Chief in Washington sends word that he wishes to buy our land. The Great Chief also sends us words of friendship and good will. This is kind of him, since we know that he has little need of our friendship in return. But we will consider your offer, for we know if we do not do so, the white man may come with guns and take our land. What Chief Seathl says, the Great Chief in Washington can count on as truly as our white brothers can count on the return of the seasons. My words are like the stars - they do not set.

How can you buy or sell the sky - the warmth of the land? The idea is strange to us. Yet we do not own the freshness of the air or the sparkle of the water. How can you buy them from us? We will decide in our time. Every part of this earth is sacred to my people. Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people.

We know that the white man does not understand our ways. One portion of the land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs. The earth is not his brother, but his enemy, and when he has conquered it, he moves on. He leaves his fathers' graves behind and he does not care. He kidnaps the earth from his children. He does not care. His fathers' graves and his children's birthright are forgotten. His appetite will devour the earth and leave behind only a desert. The sight of your cities pains the eyes of the redman. But perhaps it is because the redman is a savage and does not understand.

There is no quiet place in the white man's cities. No place to hear the leaves of spring or the rustle of insect wings. But perhaps I am a savage and do not understand - the clatter only seems to insult the ears. And what is there to life if a man cannot hear the lovely cry of the whippoorwill or the arguments of the frogs around a pond at night? The Indian prefers the soft sound of the wind darting over the face of the pond, and the smell of the wind itself cleansed by a mid-day rain, or scented with a pine. The air is precious to the redman. For all things share the same breath - the beasts, the trees, the man. The white man does not seem to notice the air he breathes. Like a man dying for many days, he is numb to the smell.

If I decide to accept, I will make one condition. The white man must treat the beasts of this land as his brothers. I am a savage and I do not understand any other way. I have seen a thousand rotting buffaloes on the prairie, left by the white man who shot them from a passing train. I am a savage and I do not understand how the smoking iron horse can be more important than the buffalo that we kill only to stay alive. What is man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beasts also happens to the man. All things are connected. Whatever befalls the earth befalls the sons of the earth.

This is a letter written to the President of the United States in 1855 by Chief Seathl (Seattle) of the Suwanish tribe of the state of Washington, regarding the proposed purchase of the tribe's land. 27

Taken from <u>The Ecologist</u>*, January, 1975, p. 31.*

OPTION #3

MATERIALS AND RESOURCES

Research materials
Meter reading sheets
Utility needs survey

PROCEDURE:

1. Have the students calculate the amount of water, gas, or electricity used daily in their homes. Have them learn to read a water meter and check theirs each day for a week.

2. Students are to fill out the chart on the following page.

3. Have the students attempt to calculate the amount of water, gas, and electricity used throughout the United States and the world.

4. Have them attempt to confirm this figure through research.

5. Repeat the first and second steps above for an additional week to see if the students' families can reduce their consumption of water, gas, and/or electricity.

DISCUSSION QUESTIONS

1. In what ways do we waste water, gas, and electricity?

2. Do you feel that your family can cut down on the use of these precious resources? How?

3. Will this cutback cause any real hardships for your family?

OPTION #3

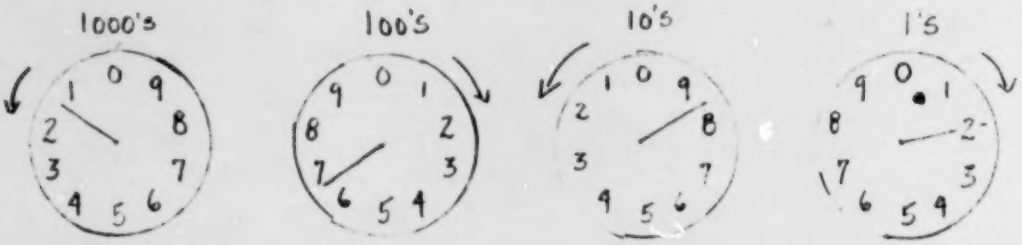
UTILITY NEEDS SURVEY

Date / Home #	Start Meter Reading	Finish Meter Reading	Total for day

29

HOW TO READ A METER

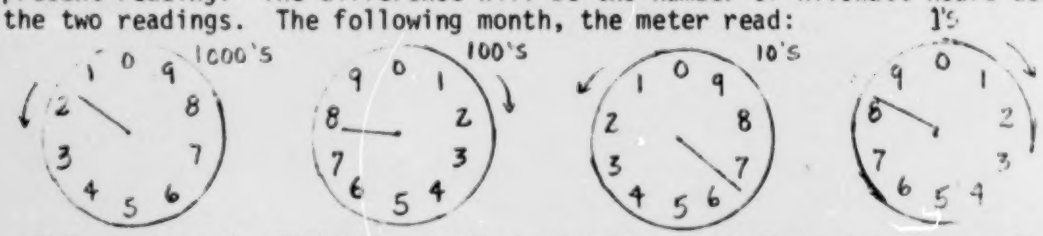
ELECTRIC: Electric meters in our homes usually have four dials as shown below:



The dial to the right shows kilowatt hours; the next one to the left shows tens of kilowatt hours; the next one to the left shows hundreds of kilowatt-hours; and the dial to the extreme left shows thousands of kilowatt-hours. The pointers rotate in opposite directions and are so geared that the pointer on the right will make one complete revolution while the one next to it on the left makes one tenth of a revolution.

To read the dials, observe the position of the pointer with respect to the numerals within the circle. Set the figures down in order as they appear on the meter, beginning with the dial to the extreme left. When a pointer is between two figures, use the smaller one as a part of the reading.

The meter above reads 1682 KWH. To obtain the kilowatt hours (KWH) used during a certain period of time, it is necessary to subtract the previous reading from the present reading. The difference will be the number of kilowatt-hours used between the two readings. The following month, the meter read:



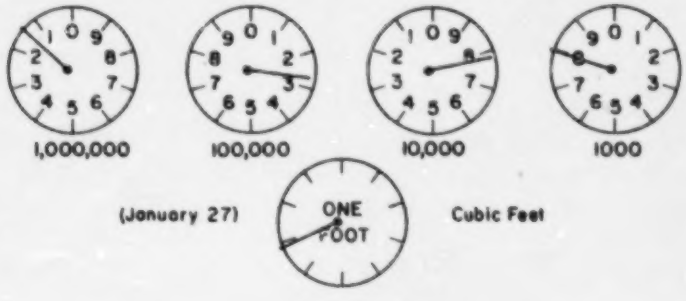
This reading is 1768 KWH. To find the number of KWH used in the period of time between the readings:

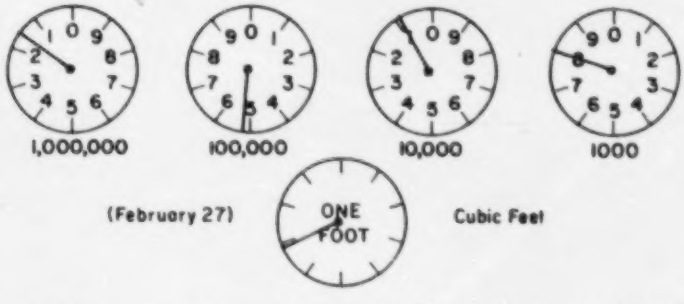
present reading	1768 KWH
- previous reading	1628 KWH
	86 KWH used

30

B. *Gas Meters*

Gas meters look like those illustrated below. The four upper dials are used in reading the meter; the lower dial is used for test purposes only. The dial at the right measures hundreds of cubic feet and the pointer must go around once to produce 1000 cubic feet. The illustrations show how the meter looked on January 27 and on February 27, the days on which it was read by the gas company meter reader.





To read the meter on January 27, begin with the dial at the left, which shows the pointer between "1" and "2." Always use the smaller number. Continue reading to the right, each dial in turn. This meter reads 1278, which means 1278 hundred cubic feet and is expressed as:

1278 C.C.F. (127,800 cu. ft.)

Roman numeral for 100 — cubic feet

1. What did the meter read on February 27? 1 from first dial, 5 from second dial, 0 from the third dial, and 8 from the fourth. **(1508)**
2. How would you find out how much gas was used from Jan. 27 to Feb. 27? (Subtract reading on Jan. 27 from reading on Feb. 27.)
3. How much gas was used? (1508 − 1278 = **230**)

POPULATION 13

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to explain how interactions between populations may be complimentary, competitive or mutually beneficial.

SUBJECT AREAS:

Science, Mathematics

KEY WORDS AND DEFINITIONS:

Complimentary - helps one or another of a pair without doing damage to the other

Competitive - helps one while damaging other

Mutually beneficial - helps both members of a pair

OPTION #1

MATERIALS AND RESOURCES

Stakes and string or hula hoops, one per group
Paper and pencils or pens
Worksheets

PROCEDURE:

1. Locate a vacant lot within walking distance of your school.
2. Teacher should look over general overview of the study - litter on the vacant lot.
3. Divide the class into groups and assign the groups to study one of the following:
   A. Bug population
   B. Plant population
   C. Types of litter
   D. Small animal population
   E. Soil composition
4. Each group should study two sample areas in the vacant lot, one which does not contain man's litter and one that does. The two areas should be approximately the same size. (If a hula hoop is being used for sampling, recommend one to five hula hoops per area, depending upon subject being studied.)
5. Fill out worksheets.
6. Graph information on a class graph using a combination of all information obtained by the groups.
7. Weigh the litter found.
8. Discuss man's interaction with other populations in his environment.

DISCUSSION QUESTIONS:

1. What do the graphs show us about the different areas?
2. What types of litter were found and in what amounts?
3. Has man interacted beneficially or detrimentally to other populations?
4. Has this been a beneficial or detrimental interaction for man?
5. What will eventually happen if man keeps on littering the earth?

TEACHER'S OVERVIEW

LITTER ON THE VACANT LOT

A vacant lot often displays man's knack for littering his environment with refuse. Obsolete and worn out materials, ranging from bits of paper to old bed springs and junk cars often find their final resting place on the lot. Living plants and animals on the lot may depend upon the litter or be altered by it.

In a vacant lot children can see the interaction between man, his litter and the plants and animals on the lot. These interactions exist because litter changes the environment in many ways. It blocks light, increases moisture, introduces different materials into the soil and provides support. Ask the children to imagine what the vacant lot would be like without the litter.

The children will probably find examples of adaptations caused by the litter. For example, a pigweed which is rooted in the soil but growing over a sheet of tar paper does not have to compete for sun, food or water with other plants. The tar paper occupies the space of the would-be competitors. A plant rooted in a small pocket of soil in a brick may not be able to grow elsewhere in the lot. A plant bending around a board in order to escape its shade, looks very different from its brother growing in full sunlight. The students may find plants and animals depending upon litter for support (e.g. twining plants), for increased moisture (slugs, sowbugs, earthworms), for reduced light (moss, mushrooms) and for other benefits.

Decomposition is also noteworthy. Evidences of it can be seen in old boards and vegetative wastes. These rotting materials will change the composition of the soil in some spots.

The attached data sheet will help the students plan their investigation. To allow for later studies, always ask them to replace any object they pick up as they are used in the data sheet. The students might complete several data sheets for one piece of litter.

BUG POPULATION DATA SHEET

1. Select an area of the lot that is not littered. Stand in the middle of this area, close your eyes and lightly toss the hoola hoop.
2. Examine the bugs inside the hoola hoop carefully. Collect, list, count, draw or photograph the types of bugs.
3. Graph the bugs on a graph shown below.
4. Move to a littered area of the lot. Once again, stand in the middle, close your eyes and lightly toss the hoola hoop.
5. Examine the bugs inside the hoola hoop carefully. Collect, list, count, draw or photograph the types of bugs.
6. Graph the bugs on the same graph, using a different color pencil to indicate that these were in a littered area.

DESCRIBE THE LITTER:

WHICH BUGS DO YOU THINK DEPEND UPON OR ARE AFFECTED BY THE LITTER. WHY?

Type of bug	How affected by litter	Good or bad effect

GRAPH OF POPULATIONS

NUMBER	TYPES	ANTS	SLUGS	WORMS	LADY BUGS					
0-5										
6-10										
11-15										
16-20										
21-25										
over 25										

35

LITTER DATA SHEET

1. Types of litter - List all the types of litter you found on the lot.

Type of litter found	Number

2. Is there any significance to the area where litter is concentrated the most?

3. List the recycleable litter.

4. List the nonbiodegradable litter.

5. What do you think is the cause for the litter found on the lot? What can be done to prevent this type of littering? What can your class do to clean up the present mess?

BIODEGRADABLE - decomposing due to bacterial action. Plant and animal wastes are biodegradable, but many mar-made waste products, especially plastics and metals are virtually indestructible in the natural environment.

36

PLANT POPULATION DATA SHEET

1. Select the area of the lot that is not littered. Stand in the middle of this area, close your eyes and lightly toss the hoola hoop.

2. Examine the plants inside the hoop carefully. List, count, draw or photograph the different kinds of plants in the area.

3. Repeat this step four or five times. Each time fill in the information on the graph indicated below.

4. Select the area of the lot that is littered. Stand in the middle of this area, close your eyes and again toss the hoola hoop.

5. Examine the plants inside the hoola hoop carefully. List, count, draw or photograph the different kinds of plants in the area.

6. Repeat step 5 four or five times. Each time fill in the information on the same graph you filled out for the unlittered area but use a different colored pencil to indicate the different area.

DESCRIBE THE LITTER:

Which plants do you think depend upon or are affected by the litter? Why?

Type of plant	How affected by litter	Good or bad effect
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	

GRAPH OF POPULATIONS

Number Types	Cluster of Grasses	Chickweed	Dandelions	Moss	Crab Grass
0-5					
6-10					
11-20					
21-30					
Over 30					

SMALL ANIMAL POPULATION DATA SHEET

1. Check the plot carefully for burrows and tunnels. (Around the base of fences, around and under cement blocks, bricks, large stones, in hollows, ground depressions, sides of banks, under matted grasses, around tree roots)

2. What animal droppings can be found on the lot? Dogs, cats, rabbits, bird, etc.

3. Map areas where animal droppings are located. If possible indicate type of animal that used the area.

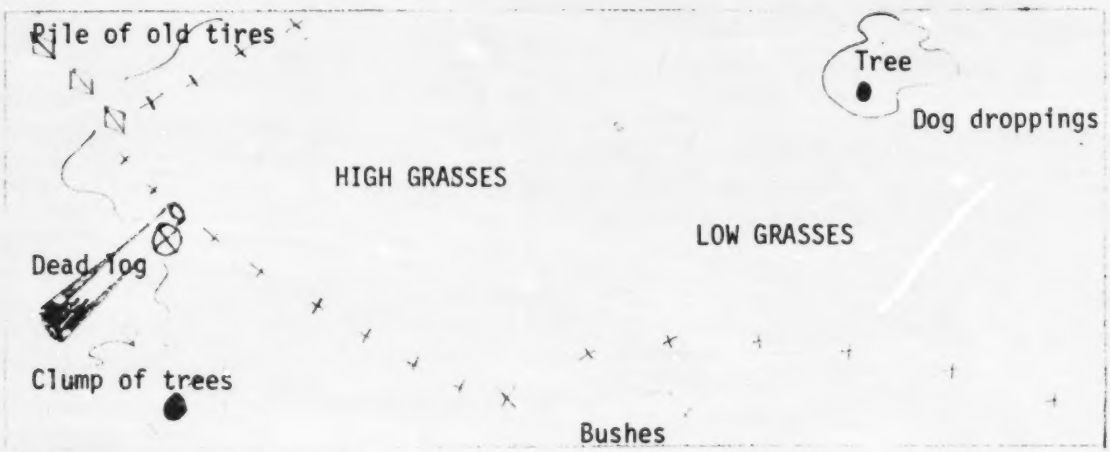
4. Watch the birds closely and see what they do when they come to the lot. Are there trees or bushes for nesting? Are there weed seeds, berries or insects for feeding? Map areas where birds are observed if possible.

5. Why would a cat or dog visit the lot?

6. Study animal tracks on the lot to determine where the animals come from and where they go on the lot. Map your findings.

7. Complete your map of the vacant lot by filling in which areas are littered and which are not. Can you determine whether the litter has any effect on the types of small animals that live on or visit the lot? Is so, what animals are affected and how?

SAMPLE MAP OF A VACANT LOT



KEY:
- X = Burrow
- ⊗ = Rabbits nest
- ● = Bird's nest
- \+ = Cat tracks
- ◊ = Mouse tracks

38

SOIL COMPOSITION DATA SHEET

1. Select several areas on the lot that are not littered. Take a small sample of the soil from each of these areas. Describe the area and the type of soil found. Indicate if there is any sitting water nearby. If so, what caused it? (low spot, recent rain, creek nearby)

   AREA 1

   AREA 2

   AREA 3

   AREA 4

2. Select several areas on the lot that are littered. Take small samples of the soil from each of these areas. Describe the area, type of litter and the type of soil found. Indicate if there is any sitting water. If so, what caused it? Is this area damper than the unlittered area? Why?

   AREA 1

   AREA 2

   AREA 3

   AREA 4

3. List types of litter that you think may have an effect on the composition of the soil and tell how it affects it.

4. Compare similar areas that were littered and not littered.

OPTION #2

MATERIALS AND RESOURCES

Access to your school site
Large paper or plastic trash bags
Access to a telephone and a telephone directory
Paper and pencil for each student
Large poster paper or large school map
Crayons or colored ink markers
Bathroom scale
Old newspapers
Scissors
Shoebox or similar sized container

PROCEDURE:

1. Use a large school site map or draw one on poster paper. Include the streets immediately adjacent to it. Ask students to help think of features which should be included, such as buildings, paved areas, planted areas, etc.

2. Divide the students into groups of five.

3. Distribute one trash bag to each group.

4. Have the groups collect as much litter from the total site area as possible over a one or a two hour period. If appropriate, also extend the pick up to the streets immediately adjacent to the school site as mapped on the poster.

5. Upon returning, have the students write their names on equal-sized slips of paper which can be used in a drawing.

6. Place these in the shoebox.

7. Have one student draw three names from the box.

8. These three will contact:

   A. The school's custodian

      (1) Tell the custodian that their class is doing a study of the cost of cleaning up litter.

      (2) Have them ask him how much time it takes him to pick up litter from the site.

      (3) Does he consider littering to be a problem at the school?

(4) Do outdoor trash containers at the school (if any) help or are they used only occasionally?

B. The school system's building maintenance office

(1) Have them phone the office and explain their purpose.

(2) Have them ask for the number of custodial personnel employed system-wide.

(3) Is school site littering one of the major problems the office must deal with?

(4) Can the office give them an idea of how much money of their annual budget goes to litter pick-up and disposal?

(5) How does the office dispose of litter after it is picked up?

9. Have the other students sort the litter on sheets of newspaper according to what it is made of. (Paper, glass, metal, etc.)

10. Have them weigh and record the weight of each pile.

11. On the map have the students indicate with small "x" marks the locations where the litter was picked up.

12. Have the three students chosen to contact the school custodian and the maintenance office report their findings to the class.

DISCUSSION QUESTIONS:

1. Did you find any concentrations of litter when all the "x's" were placed on the map?

2. How can you account for this?

3 What was the total weight of the litter you picked up?

4. If each of you were paid $? per hour to pick up litter around your school, what would be the cost per pound of litter you picked up?

5. Judging from the "x's" you placed on your map, where might all this trash come from?

6. What kinds of litter did you pick up?

7. Were the pieces of litter you found designed to be disposable by their manufacturers?

OPTION #2 Cont

8. List the names of the different kinds of materials that went into making the litter in the different piles.

9. Judging from the weight of the piles, which material was used in making the things that ended up as litter?

10. If your school has outdoor trash containers, are they used regularly? why or why not?

11. How does your school dispose of the litter that the custodian collects?

12. Is this disposal method different from that used in other schools? Why or why not?

13. Judging from the way that litter is disposed of at your school, how many jobs are involved between the time the litter is tossed out by someone and finally disposed of in the place it ends up in?

14. Why is the disposal of litter so costly?

15. Would you enjoy the job of picking up litter for a living? Why or why not?

16. What would your school site look like if litter was never picked up and disposed of?

17. What are some of the reasons why people litter?

18. Who are some of the people who pay for litter pick-up and disposal?

19. Would it be cheaper to continue littering or for everyone individually to dispose of his trash?

20. Could the materials used in manufacturing the things we dispose of be used to manufacture other things?

21. Is this being done now in your own community? Why or why not?

FURTHER ACTIVITIES:

Have the students extend the clean-up project beyond the school grounds. Have them:

1. Identify a problem area

2. Develop a plan of action: i.e., a) clean it up; b) notify someone about the problem c) write letters, etc.

3. Carry out the plan.

OPTION #3 - Spring or Fall

MATERIALS AND RESOURCED

One Terrarium
Screening
Mealworms or worms
Assorted Plants
Small Animals (Toads or salamanders)
Small Bowl with water in it
Sand
Black Dirt
Peat Moss
Rocks
Dry Small Dead Log

PROCEDURE:

1. Create a population of your own by asking each student to bring in a small plant for setting up a terrarium or two.
2. Have some of the students bring in either toads or salamanders. The total number of either animal should not exceed three. (Snakes are also excellent for study)
3. Place several stones on the bottom of the terrarium and place the screen over them.
4. Next mix the sand, dirt and peat moss and place it on the screen. The mixture should be at least 3 to 4 inches in depth.
5. Arrange the rocks, water dish and log to make the terrarium as attractive as possible.
6. Plant your greens and water.
7. Add the animals last.
8. Feed the animals worms or mealworms periodically.
9. You will find that both toads and salamanders like to dig. Keep track of the number of plants you start with and how many you end up with.

DISCUSSION QUESTIONS:

1. What kinds of plants did we add to the terrarium?
2. How many plants did we start with?
3. How many are now left?
4. What happened to some of the plants?
5. What caused this to happen?
6. How does the destruction of land and trees used for subdivisions relate to the theme of this unit? Interactions between populations may be complementary, competitive or mutually beneficial.

43